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Anna Sierpinska (1947–2023) – outstanding researcher in mathematics education*

Anna Sierpinska[1], Professor Emerita at Concordia University in Montreal, known internationally as a Polish-Canadian scholar in mathematics education, passed away on October 19, 2023. She received her mathematical education in Poland, at the University of Warsaw. She obtained a PhD in didactics of mathematics at the WSP (Wyższa Szkoła Pedagogiczna, i.e., the National Higher Teacher

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[1]In her professional activities, Anna used the English surname Sierpinska (in Polish: Sierpińska or Sierpińska-Jankowska).

Training College) in Krakow (current name: University of the National Education
Commission). She was an academic in Poland, and then – since 1990 – in Canada.
She conducted intensive didactical research related to various aspects of the process
of learning mathematics, and was particularly appreciated for her contributions
to the research on epistemology and understanding in mathematics. She was an
extremely active participant in international efforts for improving mathematics
teaching. While working in Canada, she kept a keen interest in the issues of the
didactics of mathematics in Poland. She participated in didactic conferences or-
ganised in Poland and invited Polish educators to Montreal to hold classes at Con-
cordia University. She promoted Polish research in mathematics education on the
international scene, promoted the journal "Dydaktyka Matematyki" in foreign en-
vironments, and provided substantive and linguistic support to Polish researchers
of the didactics of mathematics.

1. Key facts from the biography of Anna Sierpinska[2]

Three periods can be distinguished in Sierpinska's life and work, taking into
account where she lived, the stages of her education, and where she worked. These
periods are: 1947–1963, 1963–1990, 1990–2023.

1947–1963: Wroclaw, Cairo, Damascus

Anna Sierpinska was born on June 17, 1947 in Wroclaw, to a family of intellec-
tuals. She spent five years of her early youth (1958–1963) with her parents outside
of Poland – one year in Cairo and four years in Damascus. There, she studied at
international schools, which helped her become fluent in French and English. In
1963, she obtained a certificate of completion from a French school at the 'minor
baccalaureate' level.

1963–1990: Warsaw

In 1963, Sierpinska returned to Poland. She completed her secondary education
at the N. Żmichowska High School in Warsaw, where she passed her matriculation
exam in 1966. In the same year, she began studying mathematics at the Faculty
of Mathematics and Physics at the University of Warsaw. She graduated with a
master's degree in mathematics in 1970. Immediately after studies, she started
working at her alma mater at the Department of Algebra and Number Theory.
She worked there for 8 years, first as an assistant, and from 1972, as a senior
assistant. The subject of her scientific interest was the theory of rings. She pub-
lished three articles on this subject, but did not continue her scientific work in this
area. In 1978, Sierpinska changed employment. She took up a job as a teacher of

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[2]Main sources:

(a) Sierpinska (2020),

(b) Archives of the University of the National Education Commission in Krakow, the section
File group, scientific theses, Ref: DHP/74,

(c) "Kronika Zakładu Dydaktyki Matematyki" ["Chronicle of the Department of Didactics
of Mathematics"] of the WSP in the Main Library of the UKEN in Krakow (in the collection of
the legacy of Professor A. Z. Krygowska).

mathematics and computer science at the high school where she passed her matriculation. In 1979, she took an active part in a series of seminars on the didactics of mathematics held at the University of Warsaw by Professor Zbigniew Semadeni and Associate Professor Wacław Zawadowski. In 1980, without giving up her work at school, she took up employment at the Institute of Mathematics of the Polish Academy of Sciences in Warsaw as a senior assistant. In 1980 – inter alia as a result of her contact with French researchers in mathematics education at IREM (*Institut de Recherche sur l'Enseignement des Mathématiques de Grenoble*) – Anna Sierpinska became interested in one of the fundamental issues in the didactics of mathematics, namely the causes of difficulties in learning mathematical concepts, particularly epistemological obstacles. She decided to prepare a doctoral thesis on this topic. Her scientific supervisor was Associate Professor Wacław Zawadowski. The directions of research and the theoretical framework of the dissertation were also given to her by Professor Anna Z. Krygowska at a national seminar on the didactics of mathematics at the WSP in Krakow, where the future doctoral student presented the results of her research.

In addition to preparing her doctoral dissertation at that time, Sierpinska also participated in a very important undertaking for Polish science, namely the organisation of the 1983 *International Congress of Mathematicians* in Warsaw. In the proceedings of the congress, her contribution to the preparation of the Congress was acknowledged with the following entry: *The Congress Office, established in 1979, was supported by the administrative staff of the Institute of Mathematics of the Polish Academy of Sciences. A particularly important role was played by Anna Sierpińska-Jankowska, who was fully involved in the Congress from the very beginning* (Ciesielski, Olech, 1984, p. XII).

In 1984, she obtained her PhD in mathematical sciences in the area of their didactics at the Faculty of Mathematics, Physics and Technology of the WSP in Krakow. After obtaining the degree, Sierpinska was very active in various fields as an employee of the Polish Academy of Sciences. In the autumn of 1984, she took part in a Scientific Session[3] organised at the WSP in Krakow on November 26–28, 1984, to celebrate the 80th anniversary of Professor A. Z. Krygowska's birthday. There, she presented a paper entitled *The problem of distinguishing between difficulty and epistemological obstacle.* Between 1985 and 1990, she produced seven scientific articles on epistemological obstacles. They were published, among others, in prestigious foreign journals, such as "Educational Studies in Mathematics" and in "Recherches en Didactique des Mathematiques", as well as in the Polish journal "Roczniki Polskiego Towarzystwa Matematycznego Series V: Dydaktyka Matematyki"[4] ("Didactica Mathematicae" since 2007). In 1987, she became a member of the Editorial Board of this journal, and held this position, with a two-year break, until 2023.

In the second half of the 1980s, she took part in the work of a team which, under the direction of Professor Zbigniew Semadeni, prepared *A report on mathematics education in Poland*, commissioned by *the Committee of Experts for National Ed-*

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[3]Source: "Kronika Zakładu Dydaktyki Matematyki" ["Chronicle of the Department of Didactics of Mathematics"] of the WSP in the Main Library of the UKEN in Krakow (in the collection of the legacy of Professor A Z. Krygowska)

[4]Hereafter we use the abbreviated name: "Didactica Mathematicae"

ucation and *the Committee for Mathematical Sciences of the Polish Academy of Sciences.* The journal "Rocznik Polski Towarzystwa Matematycznego Series II: Wiadomości Matematyczne", in which the *Report* was published, contained the following note: "The following theses of the Report are the result of the work of many people. Dr Anna Sierpinska's contribution was particularly significant" ("Wiadomości Matematyczne" ["Mathematical News"], XXIX.1, 1990, p. 114.)

Anna Sierpinska was also active in the PTM, i.e. the *Polish Mathematical Society* ("Wiadomości Matematyczne" ["Mathematical News"], XXVIII.1, 1988). She was a member of the Presidium of the Main Board of this Society for one term and wrote papers, such as the one presented at the *XIII Congress of Polish Mathematicians* (September 1989, Krakow) entitled *O przeszkodach epistemologicznych związanych z pojęciem granicy* [*On epistemological obstacles related to the notion of limit*] ("Wiadomości Matematyczne" ["Mathematical News"], XXVIII.1, 1988). Master theses were also written under her supervision. One of them, by Monika Viwegier, submitted in 1990 to the *Anna Zofia Krygowska PTM Competition for the best student thesis in the didactics of mathematics*, received the second prize (Didactica Mathematicae 13, 1992, p. 56). In addition to the mentioned papers, Anna Sierpinska gave lectures at many international conferences in 1985–1990. The ICMI Executive Committee appointed her as a member of the International Programme Committee of ICME Congress 7 in Quebec, 1992 ("Wiadomości Matematyczne" ["Mathematical News"], XXIX .1, 1990).

1990–2023: Montreal

In December 1990, Anna Sierpinska was employed as an academic teacher at Concordia University in Montreal at the Faculty of Mathematics and Statistics, while at the same time being on leave from the Polish Academy of Sciences in Warsaw until 1996. She settled with her family (a husband and two sons) in Montreal. She was included in the group of academics pursuing the original programme, introduced in 1967 – *the Master in the Teaching of Mathematics* (MTM). This programme had three objectives: a) to improve the professionalism of secondary school mathematics teachers, b) to prepare college mathematics teachers, and c) to prepare researchers in mathematics education. Students studying according to this programme (often already in-service teachers) had classes in advanced mathematics and were introduced to contemporary theories of mathematics education. They learnt about teaching research methods and their results, in addition to conducting – under the guidance of their university teachers – research in mathematics education, presenting their results, and writing research reports.

Anna Sierpinska's period at Concordia University was the richest in terms of multidirectional activities. As part of her professional work, she contributed to the development of the MTM programme. She taught the following courses: linear algebra, didactics of mathematics, history and philosophy of mathematics, and research in mathematics education. Until 2016 – when the programme was discontinued – she either co-directed or managed it independently. She was the initiator of inviting well-known foreign researchers in mathematics education to periodically teach at Concordia University. Guest teachers included Alan Bell (England); David Tall (England); Colette Laborde (France); Shlomo Vinner (Israel); Tommy Drey-

fus (Israel), Gerald A. Goldin (USA), as well as Polish scientists – researchers of mathematics education: Maciej Klakla (Krakow), Ewa Łakoma (Warsaw), Edyta Nowińska (working in Germany, Osnabrück) and Anna Rybak (Bialystok).

Under Sierpinska's supervision, 28 master theses and 23 research programmes prepared by students were completed. She was a Concordia University professor in mathematics and mathematics education, as well was the supervisor of two doctoral theses.

During this period, she published extensively and collaborated with several international commissions on mathematics education issues.

Luleå University in Sweden honoured Professor Anna Sierpinska with the *honoris causa* doctorate in 2006.

2. Scientific activities of Anna Sierpinska

It is not possible to discuss completely the scientific achievements of such an eminent scientist, even less so in a short paper, therefore below, we provide selected, in our subjective opinion, important aspects of this activity.

2.1. Doctoral dissertation

In 1984, Anna Sierpinska defended her doctoral thesis entitled ***Epistemological approach to the study of difficulties in learning mathematical concepts on the example of the concept of limit***. This dissertation was supervised by Associate Professor Wacław Zawadowski (University of Warsaw) and reviewed by Professor Anna Zofia Krygowska (WSP in Krakow) and Professor Roman Duda (University of Wrocław)[5].

2.2. Expert of an international commission

Anna Sierpinska held important international positions related to mathematics education. Particularly noteworthy is her intensive work in the international movement to improve mathematics teaching. She was a member of the ICMI Commission[6] (*The International Commission on Mathematical Instruction*) from 1991 to 1994, and later served as its vice-president from 1995 to 1998. From a historical point of view, it is interesting to note that she was the first woman after World War II to be a member of the General Board of the commission (Furinghetti & Giacardi, 2010).

The aftermath of her activity on the ICMI Commission, for example, was the editing (with J. Kilpatrick) of the book *Mathematics Education as a Research Domain: A Search for Identity* (Sierpinska & Kilpatrick, 2012), containing the

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[5]Source: Documents required to start doctoral studies, submitted to the WSP in Krakow in 1983. They are currently held in the Archives of the University of the National Education Commission in Krakow – in the section File, group – scientific theses, Ref: DHP/74.

[6]The ICMI Commission was established at the 1908 International Congress of Mathematicians in Rome. Since 1952, it has been an affiliated Commission of the International Mathematical Union (IMU).

results of the ICMI-initiated study *What is research in mathematics education and what are its results?*

Sierpinska was also invited as an expert to prepare chapters for two books in the ICMI Study series:

- "The role of the history of mathematics in the teaching and learning of mathematics". In J. Fauvel, J van Maanen (eds.) *History in Mathematics education: ICMI study*, Dordrecht: Kluwer 2000, 143–170.

- "Research into the teaching and learning of the Linear Algebra", In D. Holton (ed.) *The teaching and Learning of Mathematics at University Level: New ICMI Study Series*, Kluwer Academic Publisher, 2001, 255–273.

2.3. Editorial activities

Anna Sierpinska held the prestigious position of editor of "Educational Studies in Mathematics (ESM)" in the following roles:

- 2000–2001 as a member of the Editorial Board of the ESM,

- 2001–2005 as Editor-in-Chief of the ESM,

- 2006–2010 as Advisory Editor of the ESM.

In addition, she was editor or member of the Editorial Board of the journal "Didactica Mathematicae" from 1987 to 1999 and from 2002 to 2023.

2.4. Conferences

Sierpinska participated in more than forty renowned congresses and conferences on mathematics education. These include global congresses as well as continental, international, and local conferences and symposia. She was always an active participant in every conference she attended. Anna delivered plenary lectures, various talks, and presentations, was a leader of working groups and a panel discussion leader or a panellist. According to our sources, in total, she spoke at conferences on mathematics education held in at least 38 different cities in 18 countries around the world, across 3 continents: Europe, North America, and Asia. In the remainder we briefly discuss her contributions to selected conferences and congresses.

She participated in five ICME Congresses[7] (*The International Commission on Mathematical Education*), organised by the ICMI Commission: Budapest (1988), Quebec (1992), Seville (1996), Copenhagen (2004), and Hamburg (2016). At ICME 8 in Seville (1996), she delivered a plenary lecture to open the congress, entitled "Whither mathematics education?". At the Quebec Congress (1992), alongside Jeremy Kilpatrick, she chaired a discussion of *the ICMI Study Programme Committee* preparing the main questions to be considered in the book *What is research*

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[7]The first congress was held in 1969 in Lyon, the second in 1972 in Exeter, after which the congresses have been organised every four years. The last one was held in 2024 in Sydney.

in mathematics education and what are its results? At each of the other three Congresses, Anna was either the leader of a working or thematic group, or one of the panel discussion leaders.

She also participated in the *ICMI Study Conference* in USA (Washington, University of Maryland, 1994), chairing, once again with Jeremy Kilpatrick, discussions on "What is research in mathematics education?"

She also took part in substantive mathematics-related congresses of worldwide scope. For example, she participated in the Symposium "Mathematics for All" held as part of the *International Congress of Mathematicians* in Warsaw (1983). As part of the *ICM* in Zürich (1994), she delivered a lecture entitled "What is research in mathematics education? Preliminary outcomes of an ICMI study" at the *ICMI Lectures* section. It contained the preliminary results of the *International Programme Committee* working on the *ICMI study* entitled "What is Research in Mathematics Education and What are its Results?" The work of this Committee was led by Anna Sierpinska (Canada) and Jeremy Kilpatrick (USA)[8].

She actively participated in international and renowned conferences on psychological aspects of mathematics teaching PME[9] (*The International Group for Psychology of Mathematics Education*). She has participated in ten such conferences. At one of them, she gave a plenary lecture entitled "I NEED the Teacher to Tell Me If I Am Right or Wrong" (PME 2007, Seoul). At others, she presented lectures or regularly led discussion sessions in thematic groups: Montreal (1987), Veszprem (1988), Paris (1989), Lisbon (1994), Haifa (1999), Utrecht (2001), Norwich (2002), Prague (2006), Seoul (2007), and PME-NA in Reno, USA (2011).

Sierpinska actively participated in the international conferences of CIEAEM (*Commission Internationale pour l'Etude et l'Amélioration de l'Enseignement des Mathématiques*): Leiden (1985), Southampton (1986), and Sherbrooke (1987). She presented papers at these conferences, and also participated as leader of the thematic group in Southampton.

She also participated in international thematic conferences. In Montreal in 1988, at the *International Conference on Epistemological Obstacles and* Cognitive *Conflict*, she was invited to give a plenary lecture, similarly in Bratislava in 1990, where she spoke at the *2nd International Symposium on Research and Development in Mathematics Education.*

Sierpinska also participated in broad international CERME conferences organised by ERME (*European Society for Research in Mathematics Education*): CERME 1 in Osnabrück, Germany (1998) and CERME 7 in Rzeszów, Poland (2011).

Other lectures given by Anna Sierpinska at international thematic conferences include: '*Symposium on Criteria for Scientific Quality and Relevance in the Didactics of Mathematics*' (Gilleleje, Denmark, 1992) and '*Interaction between History of Mathematics and Mathematics Learning*' (Germany, Essen 1992).

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[8]Information available at: `https://www.mathunion.org/icmi/digital-library/icmi-studies/icmi-study-discussion-documents` (Discussion document: 1994)

[9]The PME group was established at the 3rd ICME Congress in 1976 in Karlsruhe, Germany. PME conferences are held annually. The first PME conference was held in Utrecht in 1977. PME-47 was held in Auckland (New Zealand) in July 2024.

Noteworthy, local Canadian conferences in which she took an active part, include the annual conferences organised by CMESG (*Canadian Mathematics Education Study Group*). As part of these conferences, she delivered two plenary lectures: "Remarks on Understanding in Mathematics" (Burnaby, British Columbia, 1990) and "Research in Mathematics Education Through a Keyhole" (Wolfville, Nova Scotia, 2003).

She also participated in substantive conferences organised by mathematicians. One of these was the *Research Conference in Collegiate Mathematics Education* (USA, 1996), where she gave a plenary lecture entitled *Problems related to the design of the teaching and learning process of linear algebra*. Another example is the *Congress de Association Mathématique du Québec* (Trois-Rivières, Québec, 1997).

2.5. Publications

Anna Sierpinska is the author of over 80 publications. These include books, book chapters, papers for conferences on mathematics education, and scientific articles in journals such as:

- "Educational Studies in Mathematics"

- "Recherches en Didactique des Mathématiques"

- "Didacica Mathematicae (PTM Annals)"

- "For the Learning of Mathematics"

- "ZDM"

- "Journal for Research in Mathematics Education"

- "International Journal for Mathematics Teaching and Learning"

- "Instructional Science"

A number of thematic areas can be distinguished in her work. In this publication, we highlight the following five thematic areas that she dealt with and provide selected publication titles from these areas.

I. Epistemological obstacles:

- *On some difficulties in learning the concept of boundary – based on a case study* (Sierpinska, 1985).

- *Attractive fixed points and humanities students* (Sierpinska, 1987).

- *The concept of epistemological obstacle in the teaching of mathematics* (Sierpinska, 1988).

- *Proposal of a certain didactic situation for teaching the beginnings of mathematical analysis* (Sierpinska, 1990).

- *On the emergence of epistemological obstacles related to the concept of infinity in 10-12 and 14-year-old children* (Sierpinska & Vivegier, 1992).

- *A diachronic perspective in the study of understanding in mathematics - the usefulness and limitations of the concept of epistemological obstruction* (Sierpinska, 1994).

- *Epistemologies of mathematics and of mathematics education* (Sierpinska & Lerman; 1996).

- *The diachronic dimension in research on understanding in mathematics - usefulness and limitations of the concept of epistemological obstacle* (Sierpinska, 1996).

II. On understanding and meaning in mathematics:

- *Some remarks on understanding in mathematics* (Sierpinska, 1990).

- *On understanding the notion of the concept of function* (Sierpinska, 1992).

- *Understanding in Mathematics* (Sierpinska, 1994; Sierpinska, 2013).

- *Discoursing mathematics away* (Sierpinska, 2005).

III. Teaching linear algebra:

- *On one persistent mistake in linear algebra* (Hillel & Sierpinska, 1994)

- *A propos de trois modes de raisonnement en algèbre linéaire* (Sierpinska, Defence, Khatcherian, & Saldanha, 1997).

- *Cabri-based linear algebra: Transformations* (Dreyfus, Hillel, & Sierpinska, 1998).

- *Teaching and learning linear algebra with Cabri* (Sierpinska, Trgalova, & Hillel, 1999).

- *Evaluation of a teaching design in linear algebra: The case of linear transformations* (Sierpinska, Dreyfus, & Hillel, 1999).

- *On some aspects of students' thinking in linear algebra* (Sierpinska, 2000).

- *Research into the teaching and learning of linear algebra* (Dorier, & Sierpinska, 2001).

- *Methodological problems in analysing data from a small scale study on theoretical thinking in high achieving linear algebra students* (Sierpinska, & Nnadozie, 2001).

- *A Study of Relationships between Theoretical Thinking and High Achievement in Linear Algebra* (Sierpinska, Nnadozie, & Oktaç, 2002).

IV. Emotional attitudes of students towards learning mathematics:

- *Sources of students' frustration in bridging mathematics courses* (Sierpinska, 2006).

- *Sources of students' frustration in pre-university level, prerequisite mathematics courses* (Sierpinska, Bobos, & Knipping, 2008).

- *Problems of Transition from a Former to a New Professor in a Preservice Elementary Mathematics Teacher Education Course* (Savard, Sierpinska, Osana, Bobos, Royea, & Hartwick, 2009).

- *Teaching absolute value inequalities to mature students* (Sierpinska, Bobos, & Pruncut, 2011).

V. Types of reasoning – practical and theoretical:

- *A Study of Relationships between Theoretical Thinking and High Achievement in Linear Algebra* (Sierpinska, Nnadozie, & Oktaç, 2002).

- *On practical and theoretical thinking and other false dichotomies in mathematics education* (Sierpinska, 2005).

- *Discoursing mathematics away* (Sierpinska, 2005).

The quoted thematic areas of scientific activity do not exhaust the broad spectrum of research issues undertaken by Anna Sierpinska and do not constitute a classification. She addressed many other important issues in her publications.

2.6. Supervisor of doctoral theses

Anna Sierpinska promoted two PhDs based on research in mathematics education:

- Nadia Hardy's 2009 dissertation entitled *Students' models of the knowledge to be learned about limits in college level Calculus courses. The influence of routine tasks and the role played by institutional norms* (Hardy, 2009).

- Georgeana Bobos-Kristof in 2015 entitled *Teaching fractions through a Measurement Approach to prospective elementary teachers: A design experiment in a Math Methods course* (Bobos-Kristof, 2015).

She was also a mentor for doctoral schools, teaching methodology of research in mathematics education (for example in Chocerady, Czech Republic, in 2000).

3. Teaching activities of Anna Sierpinska – MTM programme

Anna Sierpinska took on the leadership of the mentioned *Master in the Teaching of Mathematics* (MTM) programme at Concordia University as its director. As part of this programme, she personally promoted 28 master theses and 23 research projects. In connection with these activities, she prepared various teaching materials in the *Lecture Notes* series. An example of such material is *Materials for teaching a course on research in mathematics education about students' difficulties in mathematics* (Sierpinska, 2019), which is a very important item containing teaching materials for classes for teachers on conducting research on students' difficulties in mathematics.

Particularly noteworthy is a paper written in 2020 posted online, and an unpublished book entitled *History of the Master in the Teaching of Mathematics (MTM) Program 1967–2018* (Sierpinska, 2020). This is a unique item which presents the purpose of the MTM programme, its activities, subjects, research projects topics, and course plans, as well as the names of all the teachers, lecturers, and students who took part in the programme. There, she wrote, among other things, "Each research project and each MA thesis was an adventure in itself for the students and for me. Each of these papers had its own interesting story to tell". She emphasised her joy regarding the fact that some of her students decided to continue their scientific development and undertook doctoral studies, with seven of them obtaining PhDs. Among others, she mentions David A. Reid, who graduated in 1992, obtained a PhD in didactics of mathematics at the University of Alberta, became a university professor, first in the USA, and later in Germany, and was entrusted with the position of editor-in-chief of the journal "For the Learning of Mathematics".

In the 117-page study, Anna Sierpinska provides a multifaceted summary of the programme's years of activity and, in a sense, bids farewell to its participants and emphasises her gratitude for working with them. Not only does she write that she was happy to accompany the students in writing these theses, but she also highlights threads of her personal involvement, for example, being glad to stop worrying about the poor financial situation of certain people or about them getting the jobs they wanted. It demonstrates her deep bond with the programme participants, her students, and student-teachers. She wrote very fondly about the colleagues who worked at the university.

4. Anna Sierpinska's links with the Polish didactics of mathematics

Anna Sierpinska received a solid education at the Warsaw School of Mathematics and Philosophy and *the Cracow School of the Didactics of Mathematics*[10]. She was an active participant in *the National Seminar in the Didactics of Mathematics*, which she also attended during her time in Montreal, after the death of Professor Anna Zofia Krygowska. For example, on May 25, 2009, she presented her paper entitled *Podejście instytucjonalne w dydaktyce matematyki na przykładzie dwóch*

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[10]Term described by Nowecki (1984).

projektów badawczych [Institutional approach in didactics of mathematics based on two research projects] for a huge audience of Polish educators and researchers from different universities. Throughout her worldwide activities, she popularised knowledge and new foreign trends as an editor of the "Didactics of Mathematics" journal, a position she held for 34 years, including publishing in Polish (see section 2.5). In this context, she introduced terms from English and French (epistemological obstacles, institutional perspective, etc.) into the Polish scientific discourse and presented, in Polish, the worldwide body of knowledge in the didactics of mathematics and new foreign trends relating to didactic research.

Sierpinska, working in Montreal, invited Polish researchers of mathematics education to periodically conduct classes at Concordia University[11].

She always supported Polish researchers in mathematics education, providing substantive advice; her assistance has also taken a material form – for example, she regularly sent photocopies of English-language literature by post (as access to foreign journals was difficult for Polish researchers).

Throughout her worldwide career, Anna Sierpinska took a keen interest in mathematics education research carried out in Poland. She regularly read Polish scientific articles in this field and promoted the research internationally in foreign journals. For example, in "Educational Studies" in "Mathematics" in the *Book Review* section (vol. 18, 1987), she promoted the journal "Didactica Mathematicae" by summarising it in French articles published in 1982, 1984, and 1985.

She also translated a selection of articles by Polish researchers and assisted in the publication process, such as in the case of Helena Siwek (1990).

She would return to visit her parents, who remained in Poland and with whom she had very close relations. Her book *Understanding in Mathematics* is dedicated to her parents. She tried to organise her stay in Poland in a way to attend conferences and meet for consultations with Polish research colleagues. For example, she participated in conferences organised in Poland: in Warsaw (2007), CERME 7 in Rzeszów (2011), CME in Wrocław (2016).

Anna Sierpinska cared very much about staying in touch with Polish researchers and felt the need to meet with us. During international congresses, she initiated "Polish evenings", where we met in our national circle with her as a mentor and our friend. One such recent meeting took place during the ICME in Hamburg in 2016. When meeting the Poles, she asked "What is happening in Krakow? Poznan? Warsaw? What are you working on?" and held scientific discussions with keen interest. Everyone she spoke to emphasised how helpful she was.

5. Anna Sierpinska – a noble and valuable person

From a cursory analysis of her curriculum vitae and research and teaching activities alone, it is clear that she had a solid education, was fluent in a number of languages – Polish, English, and French – and was an extremely committed, inquisitive researcher into learning and teaching mathematics.

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[11]The context of these invitations in mentioned in the section 1990–2023: Montreal.

Professor Sierpinska was highly regarded by her students. One of her doctoral students included the following entry in the preface to her dissertation:

> "I would like to thank my supervisor, Professor Anna Sierpinska. Since I met Professor Sierpinska in the winter of 2005, she has been a teacher in the deepest sense of the word; she has allowed me to design my own path in my research, but she has been there for every single step to illuminate what I couldn't yet see. She has helped me academically and personally through all the steps of my doctoral studies and beyond. It has been a privilege and an honor to be her student" (Hardy, 2009, Acknowledgments, p. IV).

In her paper entitled *A History of the Master in the Teaching of Mathematics (MTM) Program 1967–2018*, Sierpinska recalled the friendly relations with her colleagues and teaching friends outside of Concordia University. She emphasised that they had frequent meetings and discussions on scientific topics from their early days in Montreal. She wrote:

> "My first semester at Concordia, winter 1991, with visitors from abroad, Colette Laborde, Liora Linchevski, Shlomo Vinner, and colleagues active in mathematics education research, Joel Hillel and Nick Herscovics, made me feel as if I was at an international conference. It was quite exciting. Teaching was also exciting. I taught an MTM course on the philosophy of mathematics and an undergraduate course in Linear Algebra," (Sierpinska, 2020, p. 59).

Her colleagues at Concordia University emphasise that she was a "deep thinker" and had a wealth of knowledge not only about mathematics education, but also about philosophy, history, and culture.

She was also a great listener, extremely quick to spot connections. This opinion of Anna's friends relates to her plenary lecture at the PME Conference in Seoul (2007). The audience of that lecture was surprised that Anna was able to effortlessly spot and describe the connections between the content of her lecture and other talks taking place just before hers.

She commanded a great deal of respect from her colleagues, but she was also very open, quick to establish relationships and join discussions, and was very direct. Sierpinska's colleagues find that in difficult situations, they ask themselves: "What would Anna say?"

We fully share the views of Anna Sierpinska's Canadian colleagues[12]. She was a remarkable person, committed not only to science, but also giving support and assistance in various life situations.

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[12]Anna Sierpińska, 1947–2023. In Memoriam. Educational Studies in Mathematics 115, 5–7 (2024). `https://doi.org/10.1007/s10649-024-10301-z`.
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Hardy, N. Obituary for Anna Sierpińska. In memoriam – Obituary for Anna Sierpińska (1947–2023). A major figure of ICMI passed away: Anna Sierpińska, ICMI Newsletter – December 2023 | International Mathematical Union (IMU) (last access: 26.02.2025).

Moreover, as Polish researchers in mathematics education, we would like to state how proud we are of the achievements of our colleague, Professor Anna Sierpinska, and would like to express our great gratitude for her kindness and friendship shown to us, fellow researchers, and the help provided to us in various situations.

We are moved by her great concern, not only for her family and loved ones, but also for her colleagues, students, and pupils, as well as for the general condition of didactics of mathematics as a science (including the development of the field in Poland), and, above all, for the development of mathematics education in its broadest sense (as she emphasised in her motto, see Fig. 1).
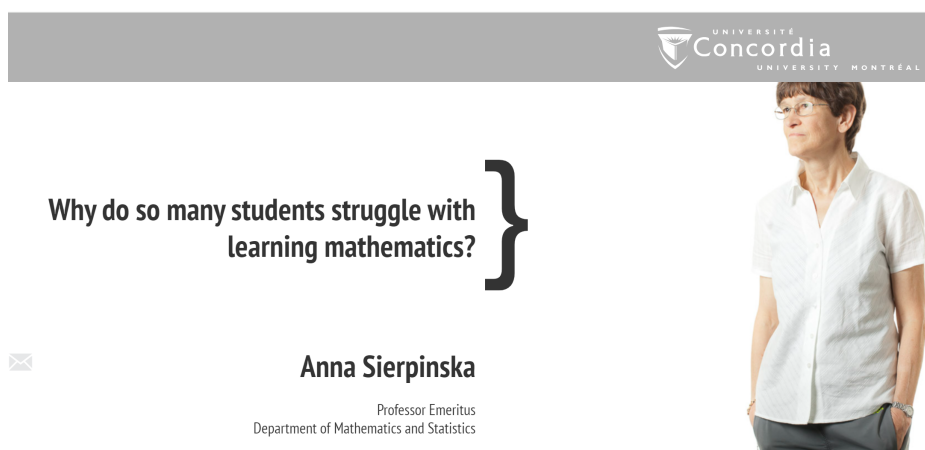

Figure 1: Anna Sierpinska – Concordia University archive website

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